

Optimal Thrust Vectoring for an Annular Aerospike Nozzle, Phase II

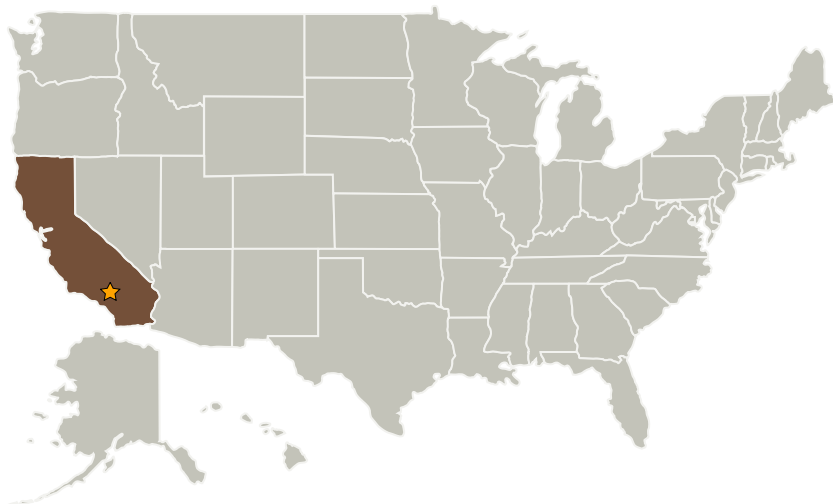
Completed Technology Project (2006 - 2008)



Project Introduction

Recent success of an annular aerospike flight test by NASA Dryden has prompted keen interest in providing thrust vector capability to the annular aerospike nozzle (AAN). The AAN with a moveable spike for thrust vectoring and throttling could provide a more efficient alternative to traditional bell nozzles. Cal Poly, which has a thrust vector research facility, has teamed with Rolling Hills Research Corporation, with CFD capability, to experimentally and analytically determine the optimal approach to thrust vectoring and throttling the AAN. In Phase I, several scale AAN models were fabricated with movable spikes that could be displaced and/or gimbaled. One set of studies quantified thrust changes as a function of spike axial position for throttling. Other studies examined the thrust vectoring effectiveness of various proprietary nozzle configurations. Schlieren photography and 3-axis force measurements showed excellent correlation to predictions made with the OVERFLOW CFD code. The most promising of the nozzle configurations for thrust vectoring and throttling were shown to produce stable flow that generates a resultant turn angle whose magnitude is in the neighborhood of current rocket booster technology. These promising configurations have been selected for extensive laboratory testing and computational analysis for optimization in the Phase II program. The objective of Phase III will be flight test.

Primary U.S. Work Locations and Key Partners



Optimal Thrust Vectoring for an Annular Aerospike Nozzle, Phase II

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Optimal Thrust Vectoring for an Annular Aerospike Nozzle, Phase II



Completed Technology Project (2006 - 2008)

Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Rolling Hills Research Corporation	Supporting Organization	Industry	El Segundo, California

Primary U.S. Work Locations

California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.4 Aeroacoustics